

REMARKS

Claim 1, the only claim pending in the application, stands rejected. New claim 2 is added.

Claim Rejections - 35 U.S.C. §103

Claim 1 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Hoshiba (6,102,755) in view of Graham et al (6,587,765). This rejection is traversed for at least the following reasons.

The Invention

The present invention is particularly concerned with a method and apparatus for controlling the outboard engine of a boat. In such environment, a stalling problem arises when the boat is switched from a forward mode to a reverse mode by operation of a shift lever, due to a large load applied to the engine when attempting to stop the vessel. As explained with respect to Fig. 1, an operational lever used by the operator acts as a remote control device 1 and comprises a throttle lever integrated with a shift lever. The lever provides an input to remote control device control unit 3, which calculates a target shift position and a target throttle opening degree and outputs data onto a communication line 4. A throttle actuator control unit 5 and shift actuator control unit 6 are responsive to signals on line 4 in accordance an algorithm illustrated in Fig. 2. The throttle actuator control 5 receives information of a degree of throttle actuator openings (7) and provides a control signal (8) to drive the throttle actuator 11 to open or close the throttle.

The shift actuator control unit 6 similarly receives shift actuator position information (9) and provides a control signal (10) to drive the shift actuator 12. The shift actuator 12 actuates the shift according to target shift position received as the control signal.

Operation of the throttle actuator control unit 5, as illustrated in Fig. 2, begins with reception of a target throttle opening degree RefThl (S2), the target shift position (S3) and a current shift position (S4). The existence of a shift-in target shift position is determined (S5) and a "shift-in" (switching from neutral to reverse or forward). This determines use of a correction value at shift connection as subsequently explained.

The key event is that the target shift position equals the current shift position (S8). If so, the throttle actuator target opening degree is made equal to the reference value (S13) and the throttle actuator is driven (S14). If this equality does not exist and a compensation is required, the throttle actuator target opening degree is made equal to zero if the target position is not in the shift-in position (S10) or is equal to K if the target shift position is in the shift-in position (S11). As a result, the load caused by the rotational axis of the propeller at the time of the shift connection is not effective and engine stalling is avoided. That is, when the target shift position is for the shift-in (neutral to reverse or neutral to forward) operation, the shift connection is conducted after the throttle actuator is driven to slightly open the throttle. This provides power to resist rotation of the drive axis. Moreover, since the throttle is already opened at the time of the shift connection, the opening operation of the throttle after shift connection is rapid. Thus, when it is determined that the target shift position is for “shift-in”, the connection is conducted after the throttle actuator is driven to slightly open the throttle. Moreover, since the throttle is already open at the time of shift connection, the opening operation of the throttle after the shift connection becomes rapid.

These features are represented in claim 1, which specifically requires several means, including a *target value calculating means* for calculating a target throttle opening degree and a target shift position based on an inputted position of an operational lever. The claim also requires a *correction throttle opening degree setting means* for setting a predetermined throttle opening degree so as to put the throttle into a small opening degree state, when the target shift position is in the shift-in state, defined as neutral-reverse or neutral-forward with this construction. A *control means* drives the shift actuator to conduct shift connection after driving the throttle actuator to put the throttle into the small opening degree state in which the throttle is opened by the predetermined throttle opening degree.

Hoshiba

The Examiner observes that Hoshiba concerns a control drive apparatus for an outboard engine and asserts that with respect to Fig. 1, the reference teaches a *control means* (single lever control mechanism 65) with lever 67, *target value calculating means* (ECU 59), throttle actuator (servo motor 73) and shift actuator (shift cam 71 coupled to dog clutching element 27). The shift

control mechanism sensor 79 and shifting sensor 83, which is coupled to the dog clutching element, are considered to be the claimed *determination means*.

The Examiner observes that Hoshiba expressly teaches that the apparatus senses when a shift is occurring (col. 1, lines 64-67 and col. 6, lines 37-50) for determining whether or not a target shift position is in a shift-in state, i.e., neutral-reverse or neutral-forward. Hoshiba teaches that the sensor 83 senses when the dog clutching elements are moved into engagement and can be utilized to provide a signal to the ECU 59 that the transmission has been shifted into engagement in either the forward or reverse direction.

However, this structure in Hoshiba detects an actual current shift position. Applicant notes that the claimed determination means is concerned with determining whether or not a target shift position is in a shift-in state. As is clear from Fig. 2 of the present application, the target shift position is different from the current shift position. Thus, given this difference in express function, the sensors 79 and 83 cannot operate as a means for determining the state of a target shift position. As explained at page 7 of the present application with regard to step S5, it is important, to determine when the target shift position received in step S3 is in a “trigger state of a shift-in”, i.e., ready to be moved from a neutral position to either a forward or reverse position. At page 5, the target shift position is calculated, rather than detected, by control unit 3 from the position of the operational lever.

The Examiner further states that the *correction throttle opening degree setting means* is an algorithm in the ECU 59 that changes the throttle opening based upon the sensed shift. However, the claim expressly requires the correction throttle opening degree setting means to have the function of setting a predetermined throttle opening degree so as to put the throttle into a small opening degree state when the target shift position is in the shift-in state (i.e., neutral-reverse or forward). The explanation of the operation in Hoshiba at col. 6, lines 37-60 teaches that the ECU is operated to sense that an operator is effecting a shifting motion, so that the throttle valve 46 will be opened beyond its normal idle position. As explained with regard in the routine in Fig. 5, this causes the engine idle speed to increase immediately after an actual shift into a new gear is made. This permits the engine speed to be increased immediately to prevent

stalling, as explained at col. 7, lines 1-4. A mode of operation illustrated in Fig. 6 also has the engine speed increased above idling before an actual shift has been accomplished, on the basis of a detected movement of the single lever control 67.

Applicant respectfully submits that neither of these teachings concerns the setting of a throttle into a small opening degree state when it is detected that the target shift position is in the shift-in state. As illustrated in Fig. 2 of the present application, the setting of a correction throttle opening degree K, which is a value obtained by matching at the time of designing or manufacturing the apparatus, is important to prevent engine stalling in the shift connection. This value is set at step S7, at the time of shift connection. As best understood by one skilled in the art, Hoshiba does not appear to teach any setting with regard to a target shift position being in a shift-in state, nor setting of a throttle into a small opening degree state.

Moreover, the Examiner admits that Hoshiba does not disclose that the target shift position is determined by a *target value calculating means*, as required by the claim. This deficiency is important since the shift actuator requires actuation of a shift in accordance with the target shift position, the determination means requires a determination of the target shift position being in a shift-in state, and the correction throttle opening degree setting means requires adjustment of the throttle opening to a small opening degree state when the target shift position is in the shift end state. Thus, several of the elements of the claim are dependent upon this calculation.

The Examiner looks to Graham et al for the missing teachings. As a preliminary matter, the Examiner first observes that Hoshiba discloses a “fly-by-wire” type throttle arrangement that has a target value calculated by the ECU 59. It appears the Examiner is suggesting that this is a calculation of a target throttle opening degree. The Examiner then asserts that it is well known for both the throttle and shift control to be fly-by-wire type with target values determined by an ECU. The Examiner looks to Graham et al for such configuration in a marine engine control environment. The Examiner concludes it would have been obvious to one of ordinary skill in the art to modify Hoshiba by making the shift operation dependent on the fly-by-wire procedure pending the ECU to determine a target shift position.

Graham et al

Graham et al does teach an electronic control unit that controls a throttle of a first engine and a shift position of a first transmission based on an electrical signal, as illustrated in Figs. 3, 4 and 5. However, there is no teaching or suggestion in connection with this disclosure or the accompanying flow charts in Figs. 8A-8G that a target shift position may be used in the manner as claimed, particularly with regard to the functions of the shift actuator, determination means and correction throttle opening degree setting means. As disclosed at col. 6, lines 7-10, a current engine throttle and transmission shift position based on the current position of the control lever 402 may be indicated. Each ECU is coupled to a shift actuator, as explained at col. 6, lines 55-67 and each shift actuator is electro-mechanically coupled to a corresponding transmission while each throttle actuator is electro-mechanically coupled to an engine, as explained at col. 7, lines 1-14. Graham et al explains that the ECU 16 controls both the shift position and the throttle based on the current position of the control arm and determines target positions for the shift of throttle actuators, as explained at col. 10, lines 4-17. In a mutual throttle warm-up condition, the ECU will enter a default mutual throttle position, which causes the engine to idle at a default mutual idle throttle rate, typically set by the engine's manufacturer (col. 10, lines 45-54). Graham et al teaches that there may be plural idle modes accommodated by the system, including a start-up mode, ordinary mutual idle mode and mutual throttle warm-up mode, as disclosed at cols. 11 and 12, and explains the operation of the ECU during such modes. The operation of the ECU when a control handle is placed into a forward idle position or reverse idle position is explained at col. 5, lines 21-29.

Applicant respectfully submits, however, that there no teaching in Graham et al of a determination means for determining whether or not a target shift position is in a shift-in state, or a correction throttle opening degree setting means for setting a predetermined throttle opening degree when the target shift position is in a shift-in state. Further, the express operation of the control means to drive the shift actuator to conduct a shift connection after driving the throttle actuator to put the throttle into a small opening degree state does not appear to be taught in Graham et al. Thus, neither reference has a teaching with regard to these limitations in the claim.

Amendment Under 37 C.F.R. § 1.111
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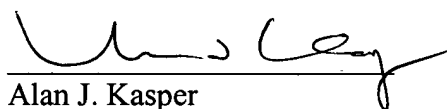
As a result, it would not be obvious to one of ordinary skill in the art to implement the structure of the invention as set forth in claim 1 on the basis of the teachings in Hoshiba or Graham et al. Thus, Applicant respectfully submits that the claim would be patentable without amendment.

Finally, as Applicant has only presented one claim to define the invention, new dependent claim 2 has been added, which is directed to features of the integral structure of the units.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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